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(12) **United States Patent
Hull**

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(54) **SONOTRODE AND ANVIL ENERGY
DIRECTOR GRIDS FOR
NARROW/COMPLEX ULTRASONIC WELDS
OF IMPROVED DURABILITY**

(58) **Field of Classification Search**

CPC B29C 65/08; B29C 66/8322; B29C
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(Continued)

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-
claimer.

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(Continued)

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(52) **U.S. Cl.**

CPC **B23K 20/106** (2013.01); **B29C 65/08**
(2013.01)

(57)

ABSTRACT

A specially designed sonotrode and anvil are adapted to be used in combination for ultrasonic welding of work pieces, to produce a narrower weld region, but one exhibiting greater durability, thereby permitting use of less packaging material. The contact surfaces comprise a surface of the anvil having a plurality of energy directors, where the plurality of energy directors are arranged into a three-dimensional grid pattern to be capable of distributed vibration-transmissive contact. The energy directors may comprise a series of plateau surfaces being regularly spaced apart from each other in a first direction, and in a second direction that is orthogonal to the first direction, to form the grid pattern. The rectangular-shaped plateaus may be spaced apart by valleys. Engagement of the energy directors of the anvil with the corresponding surface of the sonotrode may cause minor elastic deformation of work pieces positioned therebetween prior to ultrasonic welding.

16 Claims, 12 Drawing Sheets

